BANGALORE ELECTRICITY SUPPLY COMPANY LIMITED

(Wholly owned by Government of Karnataka Undertaking)

TECHNICAL SPECIFICATION FOR SHEET METAL LT A.C DISTRIBUTION BOXES FOR 100KVA AND 250KVA TRANSFORMER CENTERS WITH HYDRAULIC SINGLE TYPE DOOR

1. SCOPE:

The scope of this specification is for design, manufacture, testing and supply of outdoor type LT distribution boxes suitable for operation on 415V 3Phase,4- Wires AC, 50Hz system and required to be installed at the secondary terminals of 100KVA and 250KVA shall conform to IS 8623 / IEC 61439 and relevant BIS standards.

2. COMPONENTS:

The LT. Distribution boxes shall comprise of the following components.

1. Enclosures fabricated out of CRCA sheet of 2mm
2. EC grade Aluminium Bus Bars of purity 99.5%
3. Moulded Case Circuit Breakers (MCCB) as per IS / IEC 60947-2
4. Single door Hydraulic type bottom open.

3. APPLICABLE STANDARDS:

The L.T. Distribution Boxes with its components shall conform to the following standards of Bureau of Indian Standard (IS) and International Electro Technical Commission (IEC).

1. IS-5 -Ready mixed paints.
2. IS-104 -Ready Mixed paints, Brushing and zinc chroming
3. IS-117 -Paints finishing exterior.
4. IS-1079 -Hot rolled carbon steel.
5. IS-1730 -Steel sheet and strip dimensions.
6. IS-6639 -Hexagonal Bolts far steel structures.
7. IS-8828-1996 -MCCB's for voltages not exceeding 1000V.
8. IS-13947 - Parts I & II Circuit breakers
9. IS -8623/IEC-61439- Low voltage switchgear and control gear assemblies.
10. IS/IEC 60947-1&2 - Low voltage switchgear and control gear P-2 Circuit breaker
11. IEC 60068-2 - Environmental testing of electrotechnical products.

4. NORMAL SERVICE CONDITIONS:

The metering equipment shall be suitable for the following site conditions.

a) Min. Ambient Temperature : 5℃
b) Max. Ambient Temperature : 50℃
c) Max. Humidity : 10 to 100%
d) Altitude : Not exceeding 1000 Mtrs.
e) Rainfall : 1450mm
f) Max. wind pressure (kg/sqmm) : 150
g) Seismic level (Horz. acceleration) : 0.3g
h) Protected from limited dust ingress : IP54

5. DESIGN & CONSTRUCTION:

The enclosure shall be fabricated out of 2 mm CRCA sheet. The dimensions of the enclosure shall be 1000mm (Height)x 900mm(Width)x 275mm(Depth excluding door). The single door shall be provided with hydraulic operated mechanism front-opening from bottom side. The hydraulic mechanism shall be Smooth opening and controlled closing. The door shall have minimum 2 Nos of pad locks/ spring loaded key system. The Hinges shall be made out of 3mm thickness plate 50mm length and 4mm dia SS pins with riveted arrangements at top of the distribution box for easy swinging and minimum 2 Nos of hinges shall be provided. The door shall be of non-removable type. The U shape neoprene or EPDM gasket to avoid dust and moisture. The design shall be such that the boxes are water tight, dust and vermin proof. U-type drains shall be provided on the top and sides of drain away rainwater. Four angles of ventilating louvers with perforated sheet weld mesh shall be provided on side walls of the box. Two earthing terminals one on either side of the box, legibly identified and marked shall be provided.

Locking Arrangement to the Box: The locking arrangements to boxes shall be such that the door shall be automatically closed without applying external force. The door should be front operated with a common handle provided outside the door. Minimum 2 Nos. of padlock arrangement shall be provided for proper closing with common key. The base and doors shall have flange/collars. Collar of Base and doors shall overlap by 10mm. Rubber gasket of suitable size shall be provided in between base and doors, such that it provides proper sealing between the door and base of box to avoid penetration of dust & ingress of water. Degree of protection shall be IP- 54 as per IS-8623/1993 (amended up to date). Rubber/ EPDM gasket shall be fixed with suitable adhesive or fixing arrangement. The hinges shall be minimum 50 mm in length & made from 3mm thick sheet. The stainless steel pins for hinges shall have diameter of 4mm. The hinges shall not be visible from outside or shall be properly covered. The frame work and surface of steel panels shall be treated with seven tank process to remove Rust and scale. The interior and exterior shall be powder coated with pure polyester powder of admiral grey or as approved with thickness of minimum 80 microns.

The suitable insulated cable holders for incoming and outgoing cables of sizes shall be provided at the bottom so that cables shall be hold firmly to avoid pulling load on MCCB and busbars. A general arrangement drawing of LT Distribution boxes, suitable for 100KVA and 250KVA Distribution Transformers is enclosed for reference.

6. BUS BARS:

6.1 The Bus bars shall be of **EC grade Aluminium** flat and provided with PVC/heat shrink insulation with red, yellow and blue colour code to identify each of the phases and block colour for neutral.

6.2 The Bus bar clearances shall be as per drawing enclosed as Annexure.

6.3 The recommended sizes of the main bus bars and vertical riser links shall be as follows:-

Capacity of Transformers	Current rating in Amps	Size of Aluminium Main bus bars in mm	Size of Aluminium busbar vertical riser links in mm	Number of circuits (outgoing)
100KVA	240	6 X 40	6 X 25	2
250KVA	500	10 X 50	10 X 30	2

The bus bars shall be arranged in a staggered vertical formation and shall be supported by porcelain or DMC insulators.

6.4 The Neutral Bus Bar shall be provided of size as minimum 50% of Phase busbar with the provision of terminating Neutral cable and earthing wire.

6.5 Bus Bar and lead wire connections shall be done with M10/M8 size bolt of suitable length with 2 Nos of bolts.

6.6 **EXTENDED COPPER SPREADERS:** The MCCB Terminals shall be provided with suitable Copper spreaders for both incoming and outgoing terminals of the MCCB for connecting to the Main and Load side along with Phase to Phase insulated barriers.

7. MOULDED CASE CIRCUIT BREAKERS (MCCB):

MCCB's shall generally comply with IS-13947 Part-I & II and IS/IEC 60947-2 for Moulded-case circuit-breakers. The design and construction shall be in accordance with IS-8828-1996. The MCCB shall be **double break contact** structure and compact unit comprising of all the protective circuits. The MCCB's shall be suitable for 100KVA and 250KVA Transformers and shall be approved by BESCOM before manufacturing. The BESCOM approved frame size MCCB to be used in boxes. The required Type Test reports tested at CPRI/ERDA/Any NABL Accredited Govt. Lab as per IS/IEC 60947 part-2 shall be furnished. The minimum guarantee period for MCCB shall be 5 years.

8. RATING & CHARACTERISTICS OF MCCB:

Capacity of Transformer	Minimum Operating Current rating	Rated short circuit **(Icu)** rating capacity for 415V 50Hz at 0.25 PF kA (rms) **Ics=100%Icu**	Rated peak making capacity kA (rms)
100KVA	160 A	50kA (min)	105kA
250KVA	250A	50kA (Min)	105kA

a) Rated operating voltage- - 433V Phase to Phase
- 250V Phase to neutral.
b) Rated insulation voltage: - 660V (Min)
c) Rated impulse withstand Voltage - 8kV
d) Dielectric strength - 3kV for 1 minute.
e) Power factor for short - 0.25lag
f) Mechanical operations - 20,000 or more
g) Electrical operations - 10,000 or more
h) Current range shall not be less than operating current rating.

i) The sequence of operation for this test shall be, O - t - CO - t - CO, and t=3 min. The test shall be done at 250V at 0.25 p.f. (lag). Voltage rating phase to phase 433 V and phase to earth 250V.

j) The percentage of rated service short circuit breaking capacity to rated ultimate short circuit breaking capacity shall be mentioned as per the Table -1, of IS/IEC - 60947 (Part- 2).

k) The Percentage of Rated Service short Circuit breaking capacity (Ics) to Rated Ultimate Short circuit Breaking Capacity (Icu) shall be 100% i.e., **Ics= 100%Icu**

l) All other features of the MCCB shall conform to the IS: 13947 (Part- 2)/ 1993 & IEC - 60947 (Part-2) /2003.

m) **Type of protection:** - Overload & short circuit protection is a must with adjustable Thermal & fixed Magnetic Trip release with manual resetting.

n) **Current Limiting:-** The MCCB's directly feeding the loads shall be preferably of current limiting type such that under short circuit conditions very low cut off current and are let through for better protection of loads, cables etc.,

o) **Protective Release:-** The MCCB's shall be fitted with suitable protective release to give overload short circuit protection. The protective release and the tripping mechanism shall be such that all three poles of the MCCB shall open in case of fault on any one/two or all three poles.

p) **Current Setting:-** The current rated of the MCCB shall be for 100% of the MCCB thermal rating. The setting shall be fixed at 100% setting suitable for momentary rating and compatible with the full load current of the transformers.

q) **Casing:** The casing of MCCB shall be of Non–tracking and heat resistant insulating, non-toxic and bio-degradable material of Dough Moulding Compound (DMC) of D3 Grade as per IS:13411/1992 shall be used, no separate enclosure is required. Isolator Base should withstand the breaking capacity of 80kA to extinguish the arc immediately in MCCBs, arc chutes with minimum 8 strips shall be provided. The MCCB frame size shall not less than H=160 mm, B=100mm & D=80mm**.** MCCB casing shall be **RoHS** compliant.

r) **BIS Mark:** The BIS hall mark and certification shall be marked on the MCCB as per **3 May 2024 the Gazette of India**.

9. AMBIENT COMPENSATION:

The current setting or the tripping time shall not be affected by change in ambient conditions. The ambient compensation shall be effective over 0 degree C to 55 degree C.

10. TIME CURRENT CHARACTERISTICS:

The protective release shall have inverse time current tripping for over load and instantaneous for short circuit. The LT MCCBs shall have time current characteristics at 50 degree C ambient is as follows:

Multiple of normal Current setting	Tripping time
1.05	More than 2.5 hrs.
1.2	More than 10 minutes and less than 2 hrs.
1.3	Less than 30 minutes
1.4	Less than 10 minutes
2.5	Less than 1 minute
4.0	Not less than 2 seconds
6.0	Less than 5 seconds
12.0	Instantaneous (less than 40 milli secs.)

11. MECHANISM: The MCCB shall have manual closing mechanism, which shall be quick make, quick brake and trip free. The position of the knob shall give indication of 'ON', 'OFF' & 'TRIP'. Facility for manual tripping shall be provided.

12. TERMINATION: The terminals shall have adequate capacity for termination of Aluminium cables of size upto 3 x 240 Sq mm using long barrel heavy duty lugs.

13. EARTHING: The Earthing shall be as per clause 4.5 and sub clause thereof IS 8828 – 1996 with latest amendments thereon.

14. PAINTING & FINISHING:

The Frame work and surface of steel panels shall be treated with seven tank process to remove rust and scales. The interiors and exteriors shall be powder coated with admiralty grey pure polyester powder with minimum thickness of 80microns.

15 TESTS & TEST CERTIFICATES: In case of bought out items, routine and acceptance tests as per relevant IS and this specification shall be carried out at the original manufacturers' works.

15.1 . TYPE TESTS:

I. TYPE TEST ON COMPLETE BOX: As per IS: 8623/1993 or IEC-61439 latest amendments theron.

a. **Temperature rise test:-** The temperature rise test should be carried out as per IS: 8623 -1993

b. **High voltage test** shall be carried out as per IS:8623/1993 amended upto date.

c. **Short Time Withstand Current Test** on Distribution Box shall be carried out as per IS 8623 or latest version.

d. The Distribution Box should be subjected to rated Short Time Withstand Current Test for 2 seconds for all the circuits independently. The test should be carried out after by- passing MCCBs.

e. **Degree of protection test** on complete box shall be carried out IP 54.

f. Time/current characteristic test on MCCBs shall be carried out as per clause **10** of this specification as stated above.

g. **Protection against electric shock test** generally accepted protective measures refer to IEC Publication 364-4-41: Electrical Installations of Buildings, Part 4: Protection for Safety, Chapter 41: Protection against Electric Shock.

II TYPE TEST ON MCCB:

The type tests on MCCB as per IS/IEC-60947 amended upto date shall be carried out.

Type tests include the following tests:

a) Temperature-rise (Clause 8.3.2.5)
b) Tripping limits and characteristics (Clause 8.3.2.1)
c) Dielectric properties (Clause 8.3.2.2)
d) Operational performance capability (Clause 8.3.2.3)
e) Overload performance (Clause 8.3.2.4)
f) Short-circuit breaking capacities (Clause 8.3.4 and 8.3.5)
g) Short-time withstand current (Clause 8.3.6)
h) Performance of integrally fused circuit-breakers (Clause 8.3.7)

15.2 Type - Test certificates:

The Distribution Box, Busbar, and MCCB offered shall be fully type tested as per relevant IS and this specification. The manufacturer shall furnish detailed type test reports before supply of material. The detailed Type Test reports shall be furnished with certified drawings of the equipment tested. The BESCOM reserves the right to demand repetition of some or all the Type Tests in presence of BESCOM representatives at manufacturer cost.

All the type tests shall be carried out from tests conducted at CPRI/ERDA or any Govt. laboratory/Govt. testing houses recognised by BIS to prove that the complete box with MCCB and busbar connection to meet the requirements of the specification. The type test reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable. The date of type test shall not be older than 5 years.

The manufacturer should furnish the particulars giving specific required details of Distribution Boxes and MCCBs,

15.3 Routine Test (Carried out on all boxes):

1. Overall Dimensions Checking.
2. Insulation Resistance Tests.
3. High Voltage Test at 2500 V, 50 Hz AC for one minute.
4. Operation Test on MCCB and Busbar.
5. Heat run test on MCCB
6. Tripping Tests on MCCB :
   a) Verification of the time –current characteristic
   b) Verification of the instantaneous tripping

15.4. Acceptance Tests (on complete Distribution Box):

Following tests shall be carried out as per acceptance tests in addition to routine tests on one random sample of each rating out of the lot offered for inspection:

a) Temperature rise test on one sample of each rating.
   The temperature rise test will be carried out as per the procedure given below: For temperature rise test, a distribution box with busbar, MCCB and all assembly kept in an enclosure and passing a rated current through the circuit breaker and measuring the temperature rise of various components. This test is carried out in a controlled environment, with the ambient temperature being recorded throughout the period such that the temperature outside the box shall be maintained at 50 ° C.

b) Contact resistance test:

c) Time-Current Characteristics: The MCCB should be tested for time current characteristics at 1.05 & 1.2 times of overload release setting current as per clause 10 of this specification.

d) MCCB test operation test, S.C. current rating 50kA, Icu=Ics=100%, BIS Hall mark with certification number and casing material used for casing shall be checked.

e) **Visual Examination:** The LTDB shall be inspected visually, externally and internally for proper Powder Coating layer, fitting of all the components in accordance with technical Specification.

f) **Verification of dimensions:** Verification of dimensions, external / internal clearances will be carried out as per technical specifications.

g) **Verification of fittings:** Components like Glass, 'U' shaped latch arrangement, glands, clamps, hinges etc., will be verified as per technical specification and usage requirement.

h) **Painting:** 7-Tank process Phosphating & Powder coating facilities shall be verified at the place of inspection/ factory premises.

i) **High Voltage Test:** High voltage test at 2500 V, 50 Hz AC for one minute shall be conducted for internal wiring.

15.5 TESTING & MANUFACTURING FACILITIES:

The manufacturer must have all the in-house necessary testing facilities at manufacturer works to carry out all the Routine & Acceptance Tests during the inspection of the materials by BESCOM representatives.

The manufacturer shall show case individual parts enclosed in the randomly selected MCCB for physical verification to ensure the double break contact structure and quality of the materials used for MCCB.

The manufacturer shall furnish detailed process of manufacturing and powder coating along with facilities available at their works and sub-vendor works.

16. GUARRANTY

The manufacturer shall stand guarantee for the materials supplied including MCCB, for a period of 60 months from the date of Supply of LT distribution box or 54 months from the date commissioning of LT distribution box whichever is earlier, for manufacturing defects.

17. INSPECTION:

In respect of bought out items the manufacturer shall use equipments/ items supplied by standard/reputed manufacturers and furnish manufacturers Test certificate as well as the proof of purchase from these manufacturers (Excise gate pass) for information of the owner. The supplier shall give the owner sufficient advance intimation to arrange for inspection of the LT Distribution Boxes. The BESCOM representatives shall have easy access to the manufacturer's work place at all reasonable times of the day.

18. RANDOM SELECTION AND TESTING (RST):

BESCOM reserves the right to select random samples from the materials supplied to stores or field at CPRI or any BESCOM approved NABL laboratories. If the samples fail to pass the tests conducted at any stage, BESCOM reserves the right to reject the entire supplies made besides conforming all other penal measures as per BESCOM norms.

19. MARKING & NAME PLATE:

Each outgoing and incoming circuit near the MCCB and the exit shall be duly marked.

A Caution board of 415V rating shall be affixed on the front of the box.

A name plate incorporating the following shall be provided.

1. Manufacturer name and address
2. Owners Identification **BESCOM.**
3. Purchase order reference
4. Rating of the Distribution Box
5. Rating of MCCB used with make and other ratings.

20. DRAWING APPROVAL & DESPATCH:

The successful bidder/Supplier shall obtain GTP & drawing approval from QS&S section BESCOM and fabricate one box and offer for approval before commencement of bulk supplies. The Bulk supplies shall commence only after the sample is approved. Further the manual containing operation, maintenance of the equipment/components shall be supplied along with each distribution box.

The fabrication and assembly of equipment shall be strictly in accordance with the approved drawings and no deviations shall be permitted without the written approval of the owner. All the manufacturing and fabrication work in connection with the equipment prior to approval of drawing shall be at supplier risk.

21. PACKING & FORWARDING:

The equipment shall be packed suitably. The manufacturer/supplier is responsible for any damage to the equipment due to improper and inadequate packing. The manufacturer/supplier without any extra cost shall supply any material found short/damage without any extra cost.

General Manager, Ele.,
Quality, Standards & Safety,
BESCOM

GUARANTEED TECHNICAL PARTICULARS
ENCLOSURE & MOULDED CASE CIRCUIT BREAKER SUITABLE FOR 100 & 250KVA DISTRIBUTION TRANSFORMER
ANNEXURE-III

SL. NO.	PARTICULARS	TECHNICAL PARTICULARS
1.	Name of manufacturer	
2.	Address of Office & Works	
3.	Make	
4.	Material for enclosure	
5.	Thickness of the sheet	
6.	Degree of protection	
7.	Enclosure Treatment	
8.	Finishing type & color	
9.	Type and Model of MCCB	
10.	Number of Poles	
11.	Utilization Category	
12.	Rated Frequency, Hz	
13.	Rated Current Rating	
14.	Rated Operational Voltage (Volts)	
15.	Rated Insulation Voltage (Ui)	
16.	Rated Impulse Voltage (Uimp)	
17.	Rated Ultimate Short Circuit Breaking Capacity, Icu (kA rms)	
18.	Rated Service Short Circuit Breaking Capacity, Ics (kA rms)	
19.	Type of Operating Mechanism	
20.	Operating Principle	
21.	Type of Release	
22.	Overload Release	
23.	Short Circuit Release	
24.	Application Standard	
25.	Time Current Characteristics	

Seal and signature of the Manufacturer